SERERE TOWNSHIP SS

Permutations & Combinations – Scenario Questions (50)

Basic Arrangements

1. A school wants to form a 4-letter code using the letters **A, B, C, D, E** with no repetition. How many possible codes can be formed?
2. Five students line up to enter the lab. In how many different orders can they stand?
3. A class has 7 desks in a row. In how many ways can 7 different books be placed on them?
4. A teacher arranges 6 experiment bottles on a shelf. How many possible arrangements exist?
5. A football coach selects a goalkeeper, defender, midfielder, and striker from 10 players. How many different arrangements can be made?

Permutations with Restrictions

6. A school ID number uses digits **1–5**. How many 5-digit numbers can be formed if digits cannot repeat and the number must start with an odd digit?
7. A committee of 5 is seated in a row. If the chairperson must sit at the end, how many seatings are possible?
8. The word **LEVEL** is rearranged. How many distinct arrangements are possible?
9. In how many ways can the letters of **MISSISSIPPI** be arranged?
10. How many 7-digit telephone numbers can be formed from digits 0–9 if repetition is allowed but the number cannot begin with 0?

Circular Permutations

11. Six friends sit around a circular table. How many different seating arrangements are possible?
12. Eight beads are strung to form a necklace. How many distinct arrangements exist?
13. In how many ways can 5 children sit in a roundabout ride with identical seats?
14. A manager arranges 7 flowers in a circular bouquet. How many unique arrangements are possible?

15. Ten delegates are seated around a round table. If two particular delegates must sit together, how many arrangements are possible?

Combinations (Selections)

16. A club has 12 members. In how many ways can a 5-person committee be chosen?
17. From 8 girls and 6 boys, how many different teams of 4 can be chosen?
18. A box contains 15 pens. A student selects 3. How many possible selections are there?
19. A lottery requires picking 6 numbers from 49. How many possible tickets can be made?
20. A class of 10 students chooses 3 representatives. How many different groups can be formed?

Combinations with Restrictions

21. A team of 5 must be chosen from 7 men and 6 women, with at least 2 women. How many teams are possible?
22. A student selects 4 books from 12, where 3 specific books are compulsory. How many ways can this be done?
23. A committee of 6 is formed from 9 teachers, but two particular teachers refuse to serve together. How many committees are possible?
24. A bag has 10 red, 8 blue, and 6 green balls. How many ways can 5 balls be chosen if at least one is green?
25. Out of 10 students, a leader, deputy, and secretary are chosen. In how many ways can this be done?

Distributions

26. Six identical balls are to be distributed among 4 children. How many ways can this be done?
27. In how many ways can 10 chocolates be shared among 3 students if each must receive at least one?
28. A school distributes 12 identical pencils among 5 prefects. How many distributions are possible?
29. In how many ways can 20 identical sweets be divided among 4 children if one child gets at least 10?

30. How many solutions exist to x1+x2+x3=15x_1 + x_2 + x_3 = 15x1+x2+x3=15, where xi≥0x_i \geq 0xi≥0 are integers?

Mixed (Permutations & Combinations in Probability)

31. A box has 12 balls numbered 1–12. If 3 are chosen at random, how many possible selections are there?
32. From a class of 20, two prefects are chosen randomly. What is the probability that both are girls, given 12 girls and 8 boys?
33. A bag has 4 red and 5 blue balls. If 3 balls are chosen, how many outcomes contain exactly 2 red?
34. A school is choosing 3 students at random from 10 boys and 5 girls. What is the probability of selecting at least 1 girl?
35. A card is drawn at random from a standard 52-deck. In how many ways can 2 kings and 3 queens be selected from the deck?

Advanced Arrangements

36. In how many ways can the letters of the word **STATISTICS** be arranged?
37. In how many ways can 6 different books be arranged on a shelf if 2 particular books must stay together?
38. Eight dancers perform in a row. In how many ways can they line up if 3 specific dancers must not be together?
39. The word **MATHEMATICS** is arranged in how many distinct ways?
40. In how many ways can 9 different flowers be arranged into 3 vases, each vase getting at least one flower?

Multinomial Coefficients

41. In how many ways can the letters of the word **BANANA** be arranged?
42. How many ways can the word **DEVELOPMENT** be rearranged?
43. In how many ways can 10 identical balls be divided into 3 boxes?
44. Expand (x+y+z)5(x + y + z)^5(x+y+z)5 and state the coefficient of x2y2zx^2 y^2 zx2y2z.
45. In how many ways can the word **SUCCESS** be arranged?

Applied Real-Life Scenarios

46. A school assembly arranges 12 students in a line. How many unique orders are possible?
47. A photography session selects 5 students out of 15 for a picture. How many different groups can be formed?
48. A school choir has 20 students. How many ways can a 10-member performance group be chosen?
49. A restaurant offers 8 dishes. A customer chooses 3. How many possible meals can be made?
50. A sports event needs to schedule 6 races in a day. In how many orders can these races be arranged?

Permutations & Combinations – Extended Scenario Questions

Circular & Restricted Arrangements

51. Eight delegates sit around a round table. If two particular delegates must sit opposite each other, how many seating arrangements are possible?
52. A necklace is made from 9 beads of different colors. How many distinct arrangements can be made?
53. In how many ways can 10 dancers form a circle if clockwise and anticlockwise orders are considered the same?
54. Six married couples are seated around a round table. If no husband sits next to his wife, how many seatings are possible?
55. In how many ways can 12 people sit around a table if one person insists on sitting between two specific people?

Selections with Restrictions

56. A sports club has 15 members. How many different committees of 6 can be chosen if two specific members must always be included?
57. From 12 candidates, 4 are to be chosen, but two particular candidates refuse to serve together. How many selections are possible?
58. A school library has 10 books. How many ways can 5 be chosen if one particular book must always be included?
59. A music band of 7 is formed from 10 men and 8 women. If the band must include at least 3 women, how many ways are possible?

60. A quiz team of 4 is chosen from 6 boys and 5 girls. How many teams include at least one boy?

Distributions & Partitions

61. Ten identical sweets are distributed among 4 children with no restrictions. How many ways are possible?
62. In how many ways can 15 identical pens be distributed among 5 teachers if each gets at least 2 pens?
63. A sum of 20 coins is to be shared among 4 children so that one gets at least 5. How many distributions are possible?
64. Solve the equation x1+x2+x3+x4=25x_1 + x_2 + x_3 + x_4 = 25x1+x2+x3+x4=25 in non-negative integers.
65. In how many ways can 12 identical balls be distributed among 3 boxes such that no box is empty?

Mixed Selection & Arrangement

66. A school chooses 3 prefects (from 12) and arranges them as head, deputy, and secretary. How many possible outcomes are there?
67. In how many ways can 5 teachers be selected from 10, and then arranged in a line for a photo?
68. A box has 8 red and 6 blue balls. In how many ways can 4 be drawn if order matters?
69. From 10 players, how many ways can a captain, vice-captain, and 3 ordinary members be chosen?
70. A shop displays 5 mobile phones chosen from 12 models. If arrangement matters, how many displays are possible?

Advanced Word Problems

71. In how many ways can the letters of **ARRANGEMENT** be arranged?
72. How many distinct permutations exist for the letters of **EXAMINATION**?
73. A word is formed from the letters of **PARALLEL**. How many unique arrangements are possible?
74. How many distinct ways can the letters of **PROBABILITY** be arranged?

75. The word **SCHOOLBOOKS** is rearranged. Find the number of unique arrangements.

Probability with Combinatorics

76. A deck of 52 cards is shuffled. In how many ways can 5 cards be drawn that contain exactly 2 aces?
77. A bag has 6 red, 4 green, and 5 blue balls. If 4 are chosen, how many contain at least 1 green?
78. From 10 questions, a student must choose 4. How many ways are there if at least 1 must be compulsory?
79. A committee of 5 is formed from 7 men and 5 women. What is the probability that it contains more women than men?
80. A box has 12 bulbs, 4 of which are defective. If 3 are chosen, in how many ways can exactly one defective bulb be selected?

Arrangements with Conditions

81. In how many ways can 6 boys and 6 girls be arranged in a line if they must alternate?
82. A school flag is designed using 3 stripes chosen from 6 colors. How many different flags can be made?
83. Ten seats are reserved in a row. In how many ways can 5 prefects sit if they must occupy consecutive seats?
84. A dance group of 8 lines up for a performance. If 2 particular members must not be next to each other, how many line-ups exist?
85. In how many ways can the word **BANGLADESH** be arranged if the vowels must always come together?

Special Combinatorial Identities

86. Verify that the number of ways of choosing 2 people from 10 is equal to choosing 8 and explain why.
87. Show that the number of subsets of a set with nnn elements is 2n2^n2n. Apply this to a set of 6 elements.
88. Prove that (nr)=(nn−r)\binom{n}{r} = \binom{n}{n-r}(rn)=(n−rn) using a scenario of committee selection.

89. A farmer has 12 goats. In how many ways can he choose 4 goats for sale, showing the symmetry of binomial coefficients?

90. Show that the number of ways of choosing no student from 20 is equal to choosing all 20.

Multinomial & Generalizations

91. Expand (x+y+z)4(x + y + z)^4(x+y+z)4 and state the number of terms.

92. Find the coefficient of x2y3x^2 y^3x2y3 in the expansion of (x+y)5(x + y)^5(x+y)5.

93. In how many ways can 10 identical balls be distributed into 4 boxes if empty boxes are allowed?

94. Expand (a+b+c+d)3(a + b + c + d)^3(a+b+c+d)3 and find the coefficient of a2ba^2ba2b.

95. Find the number of terms in the expansion of (x+y+z+w)6(x + y + z + w)^6(x+y+z+w)6.

Applied Real-Life Extended

96. A school has 12 subjects. A student must choose 3 sciences and 2 arts subjects. How many possible subject combinations exist?

97. A football team selects 11 players from a squad of 18. In how many ways can this be done?

98. A restaurant menu has 10 dishes. A customer chooses 4 different dishes. How many possible meals are there?

99. A photographer selects 6 students out of 15 for a class photo. How many different groups can be formed?

100. A festival parade arranges 8 floats in a row. In how many different orders can they appear?